COMPOSITAE OF ITASCA PARK

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Introduction

During the five weeks of August, 1938 I endeavored to collect, and identify, and determine the ecological distribution of the composites of Itasca Park. As many different types of habitats were visited as possible. A careful record of the different species and their abundance in each habitat was kept, as well as notes on the type of habitat, soil, soil moisture, other plants, light, etc. Determinations as to actual species were not always possible in the field; therefore a complete collection was made and final determinations were made with the aid of the University of Minnesota botany herbarium.

For convenience of study, the following habitats were set up, not entirely in keeping perhaps with an ecologist's classification.

Jack pine forest
Spruce-Fir forest
Hardwood forest
Norway-white pine forest
Clearings and thickets of aspen, birch, spruce, and fir
Bogs
Meadows, swamps, lake shores
Fields, swales, natural open places
Roadsides and waste places

Soil samples were taken of typical habitats, and an attempt was made to determine the pH of the soils as well as the texture or physical quality of the soil. The method of soil analysis was as follows: a typical habitat was selected, and a soil sample was taken at one foot; the soil profile was recorded; testing for the pH was done with a LaMotte-Morgan soil testing set; the texture of the soil was tested by Conco-Wilde Soil Colloid Tester. The soils of Itasca Park seem to vary considerably, even within one type of habitat. For instance, in the jack pine forest along the LaSalle Trail three soil samples were taken. The pH of the soil was fairly constant, but the texture of the soil varied considerably from fine sand to heavy loam. However, one

fact was noted, and that was the profile of the soil in almost every habitat was podsolic. Horizon A always showed some shade of gray while Horizon B was some shade of yellow.

Because of lack of time, equipment and sufficient knowledge, the data collected on the soil are insufficient and not usable. I might venture to say here that if I had this problem to do over again I would use the method recommended by Wherry (1) for testing the pH of the soil and determining the reaction upon plant distribution. His method is as follows: take the equipment into the field, select the plant, dig it up, and test a small sample of soil immediately below or surrounding the roots. Do this with each species in every type of habitat visited. This method would be costly and take time, but the results, I believe, would prove that there is a correlation between the pH of the soil and the distribution of the composites.

Besides the texture and physical quality of the soil and the pH, there are many other factors which can and do determine the distribution of plants. The amount of soil moisture, chemical composition of the soil, and the amount of shade, competition with other plants, disturbance by man, animals, fire, etc., are a few factors worth considering. As far as is possible by simple observation, these facts were noted when recording the habitat of the plant.

Another point to take into consideration is the fact that the composites are high in the scale of evolution; they are prolific seeders, and generally have excellent means of seed dispersal, all of which makes the members of this family very abundant, common and conspicuous. Itasca Park, as a small area, probably leads the state for its abundance of species, and, I may add, abundance of individuals. Not only that, but because the family is still evolving, species in general have not settled down to any typical habitat.

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When dealing with 104 species and varieties, one is obliged to condense

considerably the material collected. To discuss each habitat, its soil properties, plants and their abundance, etc., would require more than I am able to give. Therefore, after listing the places visited and the results of the soil tests, I have listed the habitats with a few pertinent remarks and the number of species of composites under each according to their abundance. Then I have charted and checked the composites according to the places in which they were found. Next I have taken the composites systematically and discussed, wherever necessary, the taxonomy of the problem. Finally I have presented a check list, including Grant's check list, revised check list, rare species, and general statistics of the composites of Itasca Park.

Places Visited and Collections Made

1. August 6...jack pine forest on LaSalle Trail.

2. August 8...jack pine forest on north boundary west of Headwaters.

3. August 10..jack pine forest on LaSalle Trail and Hubbard Ravine.

    a. Jack pine forest along Trail.
    b. Jack pine forest on east side of LaSalle Springs.
    c. Hubbard Ravine, essentially prairie.
    d. Swamp at south end of Ravine.
    e. Jack pine forest from the swamp south to Park Rapids road.

4. August 13..Floating Bog Bay.
    a. Sedge mat
    b. Tamarack-spruce zone
    c. Ash-elm zone

5. August 14...Iron Springs Bog, north of Itasca Park.

6. August 15...Around Lake Itasca from Hill Point on the western side through clearings in spruce-fir and aspen, to Headwaters, and thence south to the campus via the lake shore and meadows.

7. August 17...Squaw Lake in search of Bidens Beckii; Chambers Creek; Middlewest Trail; old Western Boundary road; Bohall Bog.

8. August 18...Demming Lake; DeSoto Lake.

9. August 19...Squaw Lake.

10. August 21...Prairie west of Itasca Park. Iron Springs, Rice Lake, unbroken prairie, Roy Lake, Mahnomen, Gary, Fertile, Winger, Fosston, Bagley. Essentially prairie, but most of the vegetation is outside of the range of Itasca Park.

11. August 24...Hardwoods south of Station; also spruce-fir, ash-elm of Floating Bog Bay, and field near woodpile behind the campus.

12. August 25...Bohall Trail and west edge of Lake Itasca, observing Bidens at edge of bogs; also Schoolcraft Island. Observed the hardwoods, spruce-fir, and aspen forests along Bohall Trail.

13. August 26...Roadside. Old road cut along the north boundary near LaSalle Creek (soil very limy). Also LaSalle Creek, essentially wet meadow.

14. August 27...Roadside from Nursery to pine stand north of buffalo pen.

15. August 31...Lake shore and meadow, from campus north along the lake shore to Headwaters.

Places Visited According to Habitat

A. Jack pine forest
   1. On LaSalle Trail, August 6 and 10.
   2. On north boundary west of Headwaters, August 8.
   3. Below Hubbard Ravine, August 10.
   4. East of LaSalle Springs, August 10.

B. Norway-white pine forest
   5. At Demming Lake on top of hill, August 18.
   6. Young pine stand north of buffalo pen, August 27.

C. Spruce-fir forest
   7. South of Station, August 24.
   8. Along Bohall Trail, August 25.

D. Aspen thickets and clearings
   9. West side of Lake Itasca, August 15.
   10. Near tourist camp, August 24.
   11. Bohall Trail, August 25.
   12. Near road near buffalo pen, August 27.

E. Hardwoods
   13. South of station, August 24.
   14. On Bohall Trail, August 25.
   15. Roy Lake, west of Park, August 21.

F. Bogs, including sedge mat, tamarack-spruce forest, and ash-elm.
   16. Floating Bog Bay, August 13, August 24.
   17. Iron Springs Bog, August 14.
   18. Bohall Bog, August 17.
   19. Hill Point Bog, August 25.
   20. LaSalle Creek bog, August 26.

G. Swamps and meadows
   21. At end of Hubbard Ravine, August 10.
   22. Headwaters, August 15, August 31.
   23. East side of Lake Itasca north of the Station, August 31.
   24. Swales along Bohall Trail, August 25.
   25. LaSalle Creek meadow, August 26.

H. Lake Shore

26. Lake Itasca from Hill Point to Headwaters and south to campus, August 15.
27. Squaw Lake, August 17, August 19.
28. Demming Lake, August 18.
29. DeSoto Lake, August 19.
30. East side of Lake Itasca, August 31.

I. Fields, Roadsides, and waste places

31. Hubbard Ravine, August 10.
32. Squaw Lake, August 17, August 18.
33. Lake DeSoto, August 18.
34. Limy road cut along north boundary, August 26.
35. Roadside from nursery north to picnic grounds, August 27.

Soil Samples

1. Jack pine, east end of first stand on LaSalle Trail. August 10.
   Taken where vegetation is more abundant; sample taken at 12 inches.
   Profile:
   - Duft 1 in.
   - Humus 1 in.
   - Horizon A 2 in. (blackish clay)
   - Horizon B 5-12 in. (yellow till)

   Colloid test 31, 27, indicates light loam
   PH test 5.4

2. Jack pine, middle of stand where vegetation is nearly absent. August 10.
   Soil dryer; sample taken at 12 inches.
   Profile:
   - Duft ½ in.
   - Humus ¾-1 in.
   - Horizon A 3 in.
   - Horizon B 4½-12 in. (yellow till)

   Colloid test 40, indicates heavy loam
   PH test 5.2

3. Jack pine at LaSalle Springs on west side. August 10. Taken on a "sterile" hill; soil very sandy and dry; sample taken at 12 inches.
   Profile:
   - Duft ½ in.
   - Humus 1 in. (sandy)
   - Horizon A 4-9 in. (very light gray, sandy)
   - Horizon B 9-12 in. (yellow till)

   Colloid test 10.5, indicates fine sand
   PH test 5.4

4. Forest of red pine and balsam fir (strange), on Middlewest Trail between Elk Lake and west side cabin; ground devoid of vegetation, just a litter of pine needles; sample taken at 12 in. August 17.
   Profile:
   - Duft 1½-2 in.
   - Humus 1-1½ in.
   - Horizon A ½-1 in. (gray)
   - Horizon B 4-12 in. (yellowish gray, fine sand)

   Colloid test 26, indicates sandy loam
   PH test

5. Hardwoods, under maple-basswood-ironwood, south of tourist camp road, August 24. Vegetation consists of oak seedlings, Uvularia, Carex; very sparce, lots of deciduous leaves on the ground; soil hard, not sandy or loose; few stones, lots of roots. Taken at 11 in.
Profile:
Duft 1 in. (leaves, sticks, debris)
Humus 2 in. (black, rich)
Horizon A 3½-4 in. (dark gray, slightly blackish brown)
Horizon B 7-12 in. (loamy, hard, yellowish gray)
Colloid test over 35, indicates heavy loam, contains lots of clay.
PH test

6. Hardwoods, Bohall Trail, August 25. Mostly maple here and a few large poplar; undergrowth very little, mostly maple seedlings and a few chewed poplar "shrubs"; lots of sticks and leaves. Taken at 12 in.
Profile:
Duft 1 in.
Humus 2 in. (not well decayed)
Horizon A 1½ in. (dark gray)
Horizon B 5-12 in. (slightly yellowish)
Colloid test 32, indicates light loam.
PH test

7. Hardwoods, Bohall Trail, August 25. More undergrowth; lots of maple seedlings, Aster macrophyllus, Hepatica, grass, etc.; forest more open; soil not so rooty or stony as in 6. Sample taken at 12 in.
Profile:
Duft 1-1½ in.
Humus 1½ in.
Horizon A 1½ in. (light gray)
Horizon B 1½ in. (yellowish loam)
Colloid test 32, indicates light loam.
PH test

8. Spruce-fir, Bohall Trail, August 25. Absolutely no undergrowth whatsoever; sample taken at 12 inches.
Profile:
Duft 1-1½ in.
Humus 1 in. or less (grades into duft above and gray layer below).
Horizon A 2½ in. (gray)
Horizon B 6-12 in. (yellowish loam)
A beautiful transition was observed here between the gray horizon and the yellow horizon.
Colloid test 15, 18, indicates sandy loam.
PH test

9. Soil sample taken of the gray layer from No. 8; taken at 4 in.
Colloid test 14½, indicates fine sand, but on the border line of being sandy loam.

Habitat and Compositae

As stated in the introduction, nine habitats were studied. An endeavor has been made to check the frequency with which the different species of Compositae occur in each habitat. Instead of discussing each species individually, I will

simply list them in order of abundance. For convenience, a numerical system is used in this way:

5, represents the plant as being abundant
4, common
3, frequent
2, scarce or found occasionally
1, rare or accidental

From 3 to 5 indicates that the plants are more or less typical of the habitat in which it is listed. Below 3 means that the plant, althought it may be found and very often occurs, it is not always typical.

It would be of great advantage if I could give the pH for each habitat. But as the results of the tests were unsatisfactory, they cannot be used.

Jack Pine Forest

Soil acid (5.2, 5.4), dry, and usually sandy; podzol profile; amount of light little; undergrowth not thick.

1. Antennaria canadensis 5
2. Hieracium canadense 4.5
3. Solidago juncea 4.5
4. Aster Lindleyanus 4
5. Aster macrophyllus 4
6. Aster laevis 4 (?)
7. Liatris Rosendahlii 4
8. Liatris scariosa 4
9. Senecio Balsamitae 4
10. Achillea lanulosa 3.5
11. Solidago hispida 3.5
12. Solidago bicolor (?) 3.5
13. Antennaria neodioica 3
14. Helianthus spp. 2-3
15. Hieracium scabrum 2.5
16. Prenanthes alba 2
17. Erigeron ramosus 2
18. Cirsium muticum 1.5
19. Anaphalis margaritacea 1
20. Taraxacum officinale 1
21. Solidago canadensis 1
22. Solidago graminifolia 1

Norway-White Pine Forest

Soil acid, dry, sandy or sandy loam; podzol profile; shade dense, undergrowth sparce.

1. Antennaria canadensis 4
2. Antennaria fallax 4
3. Antennaria neodioica 3-4
4. Aster macrophyllus 3-4
5. Hieracium canadense 3-4
6. Liatris Rosendahlii 3-4
7. Senecio Balsamitae 3-4
8. Solidago juncea 3-4
9. Liatris scariosa 2-3
10. Aster Lindleyanus 2-3
11. Solidago bicolor 2-3
12. Solidago hispida 2-3
13. Solidago nemoralis 2
14. Solidago rigida 2
15. Solidago serotina 2
16. Solidago graminifolia 1
17. Krigia amplexicaulis .5
18. Crepis runciniata

The data for the norway-white pine forest was taken mostly from the young pine stand just north of the buffalo pen, a narrow strip bordering the road from the enclosure to the corner with an aspen thicket to the rear. In addition, data were collected from a small pine stand on top of a hill near Demming Lake and a forest along the Middlewest Trail west of Elk Lake. Similar stands are located near Bohall Lake.

It will be noticed that the two pine forests have much in common, similar species being found in each. Two plants in particular stand out, however. Antennaria fallax was found several times in the Park but never in the jack pine forest, always in a norway-white pine forest. On the other hand, Achillea lanulosa was never found in the norway-white pine forest. Although it occurs frequently in the jack pine, the plants seem weak and seldom flower.

Spruce-Fir Forest

A typical spruce-fir forest is nearly devoid of undergrowth, only in open places do herbs come in. By far the most conspicuous herb in these open places is Aster macrophyllus. Erigeron philadelphicus and Solidago flexicaulis were found as weak plants growing in the dense shade. Undoubtedly the dense shade is most responsible for the lack of undergrowth. The soil is acid, of course, and shows a beautiful podzolic profile.

Thickets and Clearings

This group includes aspen thickets, aspen clearings, openings in spruce-fir-aspen-birch, and clearings of spruce-fir with or without aspen and birch. Many of the waste plants and weeds creep in here, especially in the clearings.

1. Aster macrophyllus 4-5
2. Taraxacum officinale 4-5
3. Achillea lanulosa 3-4
4. Anaphalis margaritacea 3-4
5. Antennaria canadensis 3-4
6. Aster lateriflorus 3-4
7. Aster Lindleyanus 3-4
8. Erigeron canadensis 3-4
9. Erigeron ramosus 3-4
10. Helianthus spp. 3-4
11. Hieracium canadense 3-4
12. Lactuca canadensis 3-4
13. Senecio Balsamitae 3-4
14. Solidago hispida 3-4
15. Aster ericoides 3
16. Solidago serotina 3
17. Solidago rigida 2-3
18. Antennaria neodioica 2-3
19. Cirsium lanceolatus 2-3
20. Cirsium muticum 2-3

21. Erigeron philadelphicus 2-3
22. Lactuca pulchella 2-3
23. Liatris scariosa 2-3
24. Liatris Rosendahlii 2-3
25. Petasites palmatus 2-3
26. Rudbeckia hirta 2-3
27. Solidago canadensis 2-3
28. Solidago juncea 2-3
29. Solidago graminifolia 2-3
30. Heliopsis scabra 2
31. Aster umbellatus 1-2
32. Cirsium arvense 1-2
33. Iva xanthifolia 1-2
34. Aster ptarmicoides ---

Hardwood Forest

Hardwood forests in Itasca Park contain few Compositae. The soil is probably alkaline; it also contains more moisture than the pine forests, and it is in most cases not sandy, containing more clay or clayey loam.

1. Aster macrophyllus 4-5
2. Solidago flexicaulis 3-4
3. Aster lateriflorus 2-3
4. Aster Lindleyanus 2-3
5. Petasites palmatus 2-3
6. Erigeron philadelphicus 1-2
7. Prenanthes alba 1-2
8. Petasites trigonophyllus 1
9. Taraxacum officinale 1

Bogs

This includes the open sedge mat, the tamarack-spruce forest, and the dryer portions of the bog containing the ash-elm forest.

1. Aster junceus 4
2. Aster puniceus 4
3. Bidens cernua 4
4. Sonchus arvense 4
5. Aster macrophyllus 3-4
6. Cirsium muticum 3-4
7. Hieracium canadense 3-4
8. Lactuca canadensis 3-4
9. Petasites palmatus 3-4
10. Aster lateriflorus 3
11. Aster umbellatus 3
12. Bidens connata 3
13. Eupatorium Bruneri 3
14. Solidago graminifolia 3
15. Solidago canadensis 2-3.5
16. Lactuca spicata 2-3
17. Anaphalis margaritacea 2
18. Aster paniculatus 2
19. Bidens comosa 2
20. Helianthus spp. 2
21. Petasites sagittatus 2
22. Petasites trigonophyllus 2
23. Senecio palustris 1-2
24. Taraxacum officinale 1.5
25. Aster laevis 1
26. Aster Lindleyanus 1
27. Achillea lamulosa 1
28. Solidago flexicaulis 1
29. Solidago nemoralis 1
30. Solidago serotina 1
31. Sonchus asper 1 (?)
32. Solidago humulis .5
33. Solidago uliginosa .2
34. Senecio aureus ----

Meadows

This includes moist meadows, lake shores, and moist ravines. The soil is rich, and very often it may be peaty.

1. Sonchus arvense 4-5
2. Eupatorium Bruneri 4-5
3. Aster puniceus 4
4. Aster paniculatus 4
5. Helianthus spp. 4
6. Lactuca canadensis 4
7. Aster junceus 3-4
8. Aster lateriflorus 3-4
9. Bidens cernua 3-4
10. Bidens connata 3-4
11. Cirsium arvense 3-4
12. Cirsium muticum 3-4
13. Eupatorium perfoliatum 3-4
14. Hieracium canadense 3-4
15. Solidago graminifolia 3-4
16. Solidago serotina 3.5
17. Achillea lanulosa 3
18. Aster umbellatus 3
19. Lactuca spicata 3
20. Rudbeckia laciniata 3
21. Solidago canadensis 3
22. Solidago nemoralis 3
23. Anaphalis margaritacea 2-3
24. Cirsium lanceolatus 2-3
25. Erigeron philadelphicus 2-3
26. Erigeron ramosus 2-3
27. Ambrosia trifida 1 (?)
28. Lactuca pulchella 2
29. Solidago hispida 1.5
30. Senecio palustris ---
31. Aster Lindleyanus 2-3

Fields

In contrast to the wet and usually rich meadows, the division labelled "fields" takes in open areas, dry fields, dry swales, dry meadows, etc., more or less natural areas but by no means waste places. These are open places with dry and usually sandy soil.

1. Erigeron canadensis 4-5
2. Helianthus spp. 4
3. Hieracium canadense 4
4. Aster Lindleyanus 3-4
5. Cirsium arvense 3-4
6. Solidago canadensis 3-4
7. Solidago hispida 3-4
8. Taraxacum officinale 3-5
9. Taraxacum erythrospermum 3-4
10. Solidago nemoralis 3.5
11. Solidago serotina 3.5
12. Achillea lanulosa 3
13. Aster macrophyllus 3
14. Erigeron ramosus 3
15. Solidago juncea 3
16. Artemesia absinthium 2-3
17. Artemisia caudata 2-3
18. Aster lateriflorus 2-3
19. Cirsium lanceolatus 2-3
20. Heliopsis scabra 2-3
21. Rudbeckia hirta 2-3
22. Tanacetum vulgare 2.5
23. Lactuca pulchella 2-3
24. Antennaria neodioica 2
25. Antennaria canadensis 2
26. Erigeron philadelphicus 1-2.5
27. Solidago bicolor 1-2
28. Artemisia biennis 1
29. Artemisia ludoviciana 1
30. Aster laevis 1
31. Solidago flexicaulis 2.5

Roadsides and Waste Places

A great many of the compositae grow along the road and in waste places--places in which the soil has been disturbed for buildings, roads, removal of sand, etc. Many are weeds and introduced plants.

1. Erigeron canadensis 5
2. Cirsium arvense 4-5
3. Cirsium lanceolatus 4
4. Solidago canadensis 4
5. Sonchus arvense 4
6. Taraxacum erythrospermum 4
7. Taraxacum officinale 4
8. Helianthus 3-4.5
9. Solidago hispida 3-4.5
10. Solidago juncea 3-4.5
11. Solidago nemoralis 3-4.5
12. Hieracium canadense 3-4.5
13. Erigeron ramosus 3-4
14. Aster lateriflorus 3-4
15. Aster Lindleyanus 3-4
16. Aster macrophyllus 3-4
17. Aster azureus 3-4
18. Artemisia absinthium 3
19. Artemisia caudata 3
20. Achillea lamulosa 3
21. Ambrosia artemisifolia 3
22. Ambrosia psilostachya 3
23. Aster paniculatus 3
24. Lactuca canadensis 3
25. Solidago serotina 3
26. Gnaphalium uliginosum 2-3
27. Heliopsis scabra 2-3
28. Hieracium scabrum 2-3
29. Iva xanthifolia 2-3
30. Liatris Rosendahlii 2-3
31. Liatris scariosa 2-3
32. Rudbeckia hirta 2-3
33. Tanacetum vulgare 2.5
34. Aster laevis 2
35. Solidago bicolor 2
36. Arctium minus 1
37. Lactuca scariola 1
38. Crepis tectorum .5
39. Tragopogon pratense .5

Compositae and Habitat

Believing that a chart can explain the distribution of the Compositae better than words, I have compiled a list of habitats in which each species was found. Some, of course, were found to be more abundant in one place than in another. Some, like the Eupatoriums, Antennarias, Petasites, etc., are more or less restricted to adapted habitats. But, taking the list as a whole, I do not think there is any correlation, at least according to the method used. Not until the soil surrounding each plant is tested for its pH can, I believe, there be any correlation by saying that such and such a plant likes or prefers this or that type of soil and pH.

It is indeed disappointing, after spending a full month with the Compositae and expecting at least some results, to state that satisfactory results were not obtained. However, in view of the circumstances, I have tried to present the problem as it exists and to compensate for the insufficient results by compiling a check list that can be used and furthermore to compile a set of records that can be used for future work with the composites and their ecological distribution.

There are two species that are put in the aquatic column, Bidens Beckii and Senecio palustris. Neither were found, but should be looked for in aquatic or near-aquatic habitats.

	JACK PINE	NORWAY-WHITE PINE	SPRUCE-FIR	SPRUCE-FIR-BIRCH-ASPEN	ASPEN THICKETS & CLEARINGS	HARDWOODS	BOGS	MEADOWS	LAKE SHORES	DRY FIELDS	ROADSIDES	WASTE PLACES	AQUATIC
1. Achillea lanulosa.....	X	X		X	X		X	X	X	X	X	X	
2. Ambrosia artemisiifolia.											X		
3. Ambrosia psilostachya...											X		
4. Anaphalus margaritacea..	X			X	X		X	X	X	X			
5. Antennaria canadensis...	X	X		X									
6. Antennaria fallax.....		X											
7. Antennaria neodioica....	X	X		X									
8. Arctium minus												X	
9. Artemisia absinthium....										X	X	X	
10. Artemisia biennis.....										X			
11. Artemisia caudata.....										X	X	X	
12. Aster azureus.....									X		X		
13. Aster ericoides.....					X								
14. Aster junceus.....							X	X	X				
15. Aster laevis.....	X						X	X				X	
16. Aster lateriflorus.....					X	X	X	X	X	X	X		
17. Aster Lindleyanus.....	X	X		X	X	X	X	X		X	X		
18. Aster macrophyllus.....	X	X	X	X	X	X	X			X	X	X	
19. Aster paniculatus.....							X	X	X		X		
20. Aster puniceus.....							X	X	X				
21. Aster umbellatus.....					X		X	X	X				
22. Bidens Beckii.....													X
23. Bidens cernua.....							X	X	X				
24. Bidens comosa.....							X	X	X				
25. Bidens connata.....							X	X	X				
26. Cirsium arvense.....					X			X	X	X	X	X	
27. Cirsium lanceolatus.....					X			X	X	X	X	X	
28. Cirsium muticum.....	X			X	X		X	X	X				
29. Erigeron canadensis....					X					X	X	X	
30. Erigeron philadelphicus.			X	X	X	X			X		X		
31. Erigeron ramosus.....	X				X			X	X	X	X	X	
32. Eupatorium Bruneri.....							X	X	X				
33. Eupatorium perfoliatum..							X	X	X				
34. Gnaphalum uliginosum....											X	X	

	JACK PINE	NORWAY-WHITE PINE	SPRUCE-FIR	SPRUCE-FIR-BIRCH-ASPEN	ASPEN THICKETS & CLEARINGS	HARDWOODS	BOGS	MEADOWS	LAKE SHORES	DRY FIELDS	ROADSIDES	WASTE PLACES	AQUATIC
55. Helianthus spp.	X	X		X	X		X	X	X	X	X	X	
56. Heliopsis scabra				X	X						X	X	
57. Hieracium canadense	X	X		X	X		X	X	X	X	X	X	
58. Hieracium scabrum	X										X	X	
59. Iva xanthifolia					X							X	
60. Lactuca canadensis					X		X	X	X			X	
61. Lactuca pulchella					X				X				
62. Lactuca scariola												X	
63. Lactuca spicata							X	X	X				
64. Liatris Rosendahlii	X	X			X						X		
65. Liatris scariosa	X	X			X						X		
66. Petasites palmatus				X	X	X	X						
67. Petasites sagittatus							X						
68. Petasites trigonophyllus							X						
69. Prenanthes alba	X			X	X	X							
70. Rudbeckia hirta				X	X						X	X	
71. Rudbeckia laciniata					X			X					
72. Senecia Balsamitae	X	X		X	X				X				
73. Senecio palustris								X					X
74. Solidago bicolor	X	X		X	X					X	X		
75. Solidago canadensis				X	X		X		X	X	X		
76. Solidago flexicaulis			X		X	X	X						
77. Solidago graminifolia		X		X	X		X	X	X				
78. Solidago hispida	X	X		X	X			X		X	X	X	
79. Solidago juncea	X	X		X	X				X	X	X		
80. Solidago nemoralis		X		X	X		X	X	X	X	X		
81. Solidago rigida		X			X					X	X		
82. Solidago serotina		X					X	X	X	X	X		
83. Sonchus arvense							X	X	X	X	X	X	
84. Sonchus asper							X		X				
85. Tanacetum vulgare									X	X	X		
86. Taraxacum erythrospermum										X	X	X	
87. Taraxacum officinale	X				X	X	X		X	X	X	X	

Naturally in a problem of this type certain questions arise, and it is necessary before a decision can be made, to state what points, facts, characters, or authority one uses for his determinations. The following is more or less of a resumé of the problems involved in actual determination of the species. Gray, Britton and Brown, Rydberg, as well as the herbarium in the botany department at the University of Minnesota , and Grant's check list, and cards were used. Where special problems involved the use of references, these are cited.

I. EUPATORIEAE

A. Eupatorium

1. E. Bruneri Gray (E. purpureum L., as given in Gray's manual)
2. E. perfoliatum L.

B. Liatris

3. L. pycnostachya (Michx.) Kuntze, not found. Grant, however, reports it from Squaw Lake.
4. L. scariosa Willd.
5. L. Rosendahlii Rydb. This species differs from L. scariola in that the involucre bracts are erose*, dark purple bordered, larger bulb, heads fewer flowered, inflorescence shorter, more elliptic in outline. However, there are types that represent mixtures of the two.

II. ASTEREAE

C. Aster. There are 11 species of asters represented in Itasca Park and three varieties.

6. A. azureus Lindl.
7. A. ericoides L. (A. multiflorus Ait.) (2)
8. A. junceus Ait.
9. A. laevis L.
10. A. lateriflorus (L.) Britton
11. A. Lindleyanus T.&G. Seems to be a northern species. Nearly glabrous.
12. A. Lindleyanus T.&G. var. comatus Fernald., differs in that the variety is pubescent.
13. A. macrophyllus L. var. velutinus Burgess. All of the big-leaved asters seem to be of this variety.
14. A. paniculatus Lam. A difficult one. Can be easily confused with A. Puniceus and A. junceus. Most of my specimens have nearly entire leaves, slightly pubescent stem, narrow leaves (less than 1 in. broad), slightly clasping bases, and one specimen has violet flowers.
15. A. puniceus L. Rays lilac blue to white (variable as to color). Rough-hairy all over.
16. A.puniceus L. var. lucidulus A. Gray, glabrous or only slightly pubescent.
17. A. ptarmicoides T.&G. was not found; reported by Grant, 6777, September 6, 1935, in an aspen clearing, Squaw Lake.

*erose, irregular margined, as if gnawed.

18. A. umbellatus Mill. Smooth or nearly so.
19. A. umbellatus Mill. var. pubens Gray, lower surface of the leaves and branchlets tomentulose.

D. Erigeron
20. E. canadensis L.
21. E. philadelphicus L.
22. E. ramosus (Walt.) BSP

E. Solidago
23. S. canadensis L., stems and branches of inflorescence pubescent.
24. S. canadensis L. var. gilvocanescens Rydb., stems and leaves cinerous or canescent with minute puberulence.
25. S. flexicaulis L. (S. latifolia L. in Gray's Manual)
26. S. graminifolia (L.) Salisb. S.K. Harris has labelled Grant's herbarium specimen from Itasca Park var. Nutalli (Greene) Fernald--leaves more pubescent; branches of inflorescence hirtellous. However, my specimens are not "more pubescent."
27. S. juncea Ait. Less triply nerved; smooth or nearly so.
28. S. nemoralis Ait. More triply nerved; finely or densely pubescent (grayish-hoary); panicle usually turned to one side.
29. S. rigida L.
30. S. serotina Ait. Resembles S. canadensis but stem is glabrous; involucre slightly larger, forming larger heads.
31. S. humilis Pursh. (S. racemosa Greene, S. Purshii Porter). Basal leaves narrowly spatulate. Not found. Reported and collected by Grant in spruce-tamarack swamp two miles north of the Park. But from all appearances, it seems to be S. uliginosa Nutt. There are no other collections in the herbarium from Minnesota of S. humilis.
32. S. uliginosa Nutt. Occurs just outside of the Park, according to reports.
33. S. bicolor L. Rays white to cream color; stem pubescent, or nearly glabrous; basal leaves more or less pubescent, slightly serrate, but never entire; stem leaves acute only; chartaceous whitish-yellow bracts usually with a green midrib slender below, conspicuously dilated above; achenes columnar.
34. S. hispida Muhl. Rays orange-yellow; stems densely pubescent or hirsute, usually simple; basal leaves pubescent on both sides, mostly rounded at the tip; stem leaves blunt or acutish; subherbaceous greenish or greenish straw colored obtuse bracts with a green midrib nearly uniform or only obscurely dilated above; achenes slightly broadened upward.

Those are the distinguishing characteristics of the two species S. bicolor L. and S. hispida Muhl., according to the books. Most of my specimens approach S. hispida. I found no true specimens of S. bicolor; none have "white" rays. I seriously doubt whether a straight S. bicolor exists in Itasca Park. Either there is considerable mixing of the two species or else S. bicolor does not exist according to the prescribed set of characteristics.

III. INULEAE

F. Antennaria

35. A. canadensis Greene. Glabrous and bright green above.
36. A. neodioica Greene. Much smaller than A. canadensis, and has definite spatulate basal leaves; tomentose above.
37. A. fallax Greene. Apparently all are of this species, A. plantaginifolia being absent from the Park. No collections reported. Found by Grant in Ponsford Prairie (wherever that is). The main difference between the two plants is in the size of the flowers--A. fallax flowers are slightly larger, (8-10.5 mm. high; in A. plantaginifolia they are 6-8 mm. high. The basal leaves of A. fallax are obovate or rhombic-obovate, narrowed from near the middle to the acutish or blunt tip; in A. plantaginifolia the basal leaves are broadly obovate to oblanceolate. From the herbarium specimens, in general, A. fallax has leaves that are slightly narrower, while A. plantaginifolia has leaves that are broader. The plants collected are sterile this time of year, of course, so that the shape of the leaves is the only thing to go on. However, I think it is safe to say that A. plantaginifolia is not found in the Park.
38. A. plantaginifolia (L.) Richards. See above.

G. Anaphalis
39. A. margaritacea (L.) B.&H.

H. Gnaphalum
40. G. uliginosum L.

IV. HELIANTHEAE

I. Ambrosia
41. A. artemisiifolia L. Leaves thin, bi-pinnatifid.
42. A. psilostachya DC (now A. coranopifolia Torr. ??) Leaves thicker, once-pinnatifid
43. A. trifida L. Not found; reported by Grant from Headwaters, July 22, 1933.

J. Bidens, a very variable group.
44. B. Beckii Torr. (Megalodonta Beckii (Torr) Greene) Not found but reported by Grant from Squaw Lake, Sept. 6, 1929.
45. B. cernua L. Distinguished by the connate-perfoliate base of the leaves and usually hispidulous stem.
46. B. cernua L. var. integra Wiegand (5). A very large plant with broad minutely serrate or entire leaves.
47. B. cernua L. var. mininia (Huds.) DC Tiny, very dwarf plant (4-14 cm. high), with very small spatulate or oblanceolate petioled leaves, and usually solitary heads that are usually less than one-eighth of an inch broad. Grant collected it on a sedge swale, clay soil, Bohall Lake, Sept. 4, 1929; "infrequent." Only one specimen represented in the herbarium. (5) Likes floating logs.
48. B. cernua L. var. oligodenta Fern. & St. John. Has small fleshy leaves, mostly obtuse, few and obscure dentations; outer involucre bracts oblong and much exceeding the inner series. Grant has it from lake shore of Itasca Lake near the foot, Aug. 23, 1929. A very characteristic plant, growing depressed or matted, freely branching near the base. (4). The three varieties of B. cernua collected by Grant at Itasca Park are represented in the herbarium at the University.

49. Bidens comosa (Gray) Wiegand. Leafy bracts, foliacious; achenes flat, about 1cm. long; winged petioles.
50. B. connata Muhl. Usually with purplish stem; achenes angled; slender petioled; leaves sometimes deeply parted, especially the lower ones.
51. B. connata Muhl. var. pinnata Watson. It is possible that there are some plants that approach this variety. (5). On the edge of the bog opposite Schoolcraft Island I have collected a plant that has most of its leaves divided and closely fits the description of the variety.
52. B. connata Muhl. var. fallax (Warmst.) Sherff. Collected by Grant on Schoolcraft Island, July 30, 1929 (6).
53. B. foliosus ???

The Bidens, at least the ones I collected, do not fit the descriptions. B. connata and B. comosa prove variable. Some of my plants are too young to determine with accuracy the shape of the achenes.

K. Helianthus

Here I hesitate, debating just what to say. The sunflowers have proven to be a headache. Only a botanist with considerable knowledge behind him and a lot of patience can work out the sunflowers. Lacking both requirements, I have hit a snag. They just won't key out right; even Watson's key and descriptions helped little. However, basing my contentions on my own observations, I have come to suspect about eight species of Helianthus are living within the boundaries of Itasca Park. Quoting Watson but slightly changing the wording, I may say that "these eight species are really one species with eight modes of expression." Again from Watson (3), "The particular placement of an individual plant will very often have to remain, in this genus at least, a matter of great difficulty." It is a well recognized fact that the sunflowers are an unstable group. I could simply let the matter go by saying "Helianthus sppp." But such is not the case. I have found evidence, as I have said before, of eight species in the Park. Whether or not there really are eight species is another question. The value of stating that there are eight species is merely a record to work on later.

54. H. borealis Watson. Resembles H. giganteus but differs in being smaller; leaves frequently opposite; smaller

inflorescence; partly distinct petioles; pubescence on the lower surface of the leaves.

55. H. decapetalus L. This I know occurs in several forms.
56. H. grosse-serratus Marten. Doubtful if a good specimen occurs in the Park. However, I have collected one specimen that seems to fit the description.
57. H. giganteus L. Leaves normally alternate; pubescence on the underside of the leaf usually along the nerves.
58. H. membranaceus Watson. Another one that resembles H. giganteus. Has larger leaves, thinner, mostly glabrous beneath; rays longer. Rosendahl reports in sandy soil of jack pine along the LaSalle Trail, Sept. 7, 1929.
59. H. scabarrimus Ell. (H. rigidus Desf., H. subrhomboideus Rydb.). Has disc flowers that are red or purple. No sunflower was seen that had red or purple disc flowers or even approaching those colors.
60. H. tuberosus L. Several plants have keyed out to this species, but few fit the descriptions. It undoubtedly occurs in the Park in some form or another.
61. H. Maximiliani Schrad. This is the only one that I am sure of, and at that I did not find it in the Park. Grant reports it from Squaw Lake.

L. Heliopsis
62. H. scabra Duval.

M. Iva
63. I. xanthifolia Nutt.

N. Rudbeckia
64. R. hirta L.
65. R. laciniata L.

V. ANTHEMIDEAE

O. Achillea
66. A. lanulosa Nutt. Quite pubescent stems, etc., indicate that it is not A. millifolium (A. millifolium has a flat-topped corymb; nearly glabrous stem; numerous stem leaves; and is taller).

P. Artemisia
67. A. absinthium L. Naturalized from Europe. Planted in the Park some time ago and has since escaped.
68. A. biennis Willd. This is a new species for the Park. Its lower leaves are two-pinnately parted, the upper pinnatifid; the divisions are cut-toothed or serrate. Found near Squaw Lake along the old wagon road.
69. A. camporum Rydb. This is a Rydbergian species, a split from A. canadensis. No record of it is being found in the Park, but recorded in Grant's check list.
70. A. caudata Michx.
71. A. ludoviciana Nutt. (A. gnaphalodes Nutt.??). Reported by Grant from Squaw Lake, July 23, 1933.

Q. Matricaria
72. M. chamomilla L. Fugitive from Europe. Moyle has it from a farm yard along the south boundary, July 18, 1933. Probably escaped from cultivation.
73. M. suaveolens (Pursh.) Buckenan. Grant reports it from a farm yard along the south boundary. Adventive from the

Pacific Coast where it is abundant. Probably cultivated in the farmer's garden.

R. Tanacetum

74. T. vulgare L. Introduced from Europe.

VI. SENECIONEAE

S. Petasites

75. P. palmatus (Ait.) Gray
76. P. sagittatus (Pursh.) Gray
77. P. trigonophyllus Greene (7).
78. P. vitifolia Greene (7). Cut of the large leaf intermediate between that of P. palmatus and P. sagittatus, configuration like that of the grape leaf in general.

T. Senecio

79. S. aureus L. Found by Grant at LaSalle swamp, July 14, 1934.
80. S. Balsamitae Muhl.
81. S. palustris (L.) Hook. Apparently common in wet places, but I did not find it.
82. S. plattensis Nutt. Grant collected it near Thief River Falls, July 18, 1934. Out of bounds.

VII. CYNAREAE

U. Arctium

83. A. minus Bernh., Naturalized from Europe. New for the Park. Found below Hubbard Ravine along an old grassy wagon road in a more or less shaded place. Probably brought in by horses a long time ago. Have not found it anywhere else in the Park. A beautiful patch of plants, 6-8 ft. tall; leaves 1-1½ ft. across and 2 ft. long; flowers a beautiful shade of purple.

V. Centaurea

84. C. cyanus L. Nothing more nor less than the garden Bachelor's Button. No record of it. Probably escaped from cultivation.

W. Cirsium

85. C. arvense (L.) Robs. Naturalized from Europe.
86. C. lanceolatus L. Naturalized from Europe.
87. C. muticum Michx.

VIII. CHICHORIEAE

X. Crepis

88. C. runcinata (James) T.&G. Not found, but Grant has it reported in NW-NW-18, Norway Pine, July 9, 1931, No. 534. Only reported once in Minnesota and that is a collection made by Rosendahl, Butters, and A. W. Johnson on July 17, 1931 on a prairie east of Ortonville. Other herbarium specimens are from Utah, North and South Dakota. Distribution in Gray says, "on saline soil, Man. to Ia., and westward;" Britton and Brown say, "on moist soil, Iowa to Manitoba west to Utah and Montana." It is possible that, as the flowering stalks are gone, I failed to recognize the plant; I doubt it, however, as the basal leaves are very characteristic and not easy to overlook. All of which leads up to the fact that if the plant occurs in the Park it is extremely rare.
89. C. tectorum L. Found by J. Moyle June 30, 1936, roadside near Wegmann's store, No. 2132. An annual adventive from Europe. May or may not have established itself in the Park.

Y. Krigia

90. K. amplexecaulis Nutt. Found by Rosendahl July 10, 1929 in Norway-white pine forest along the LaSalle Trail. Failed to find it.

Z. Hieracium

91. H. canadense Michx. Common. Differs from H. umbellatum in that the leaves, at least the upper, are clasping; involucre is pubescent; leaves coarsely toothed and rounded at the base.

92. Hieracium umbellatum L. The leaves are sessile, not clasping; the leaves are narrower and shorter, entire or nearly so, attenuate at the base; involucre is glabrous or nearly so.
No typical H. umbellatum was found. No Minnesota specimen in herbarium. Grant reports it from road near the fire tower, poplar forest, June 24, 1933. Outside of this report there is no other record, to my knowledge, of H. umbellatum being found in Minnesota.

93. H. scabrum Michx.

AA. Lactuca

94. L. canadensis L.

95. L. pulchella (Pursh.) DC

96. L. ludoviciana (Nutt) Ridell. Not found. Reported by Grant in NW-NE 11, 143-36, Abies-Betula, one clump with "no beak yet," July 24, 1929. Resembles L. scariola, but flowers are larger.

97. L. scariola L. Adv. from Europe.

98. L. spicata (Lam.) Hitchc. Easily recognized by its tawny pappus and cream to blue colored small flowers.

BB. Prenanthes

99. P. alba L.

CC. Sonchus

100. S. arvense L.

101. S. asper (L.) Hill.

All seems to be S. arvense--glandular pubescent involucre; achenes rugose (about 10 ribs), transversely wrinkled; leaves mostly divided. However, I have collected one plant that seems to be S. asper, but the achenes are not developed sufficiently to make any final determination. The leaves fit well with the description, but the involucre seems slightly hairy.

DD. Taraxacum

102. T. erythrospermum Andrz.

103. T. officinale Weber.

Both species are in the Park, but mostly sterile plants were encountered and it is not always an easy matter to designate which species they are just on the leaf characteristics.

EE. Tragopogon

104. T. pratense L. Naturalized from Europe. Not found, but Grant reports it from the roadside near Douglas Lodge, 1933. Perhaps it hasn't got a footing in the Park as yet.

Compositae of rare, incidental, or doubtful occurrence in Itasca Park --

This list includes cultivated plants, species that have been reported only once, species that are difficult to determine, and those that are difficult to find.

1. Ambrosia trifida
2. Antennaria plantaginifolia
3. Arctium minus
4. Artemisia biennis
5. Artemisia camporum
6. Artemisia ludoviciana
7. Aster ptarmicoides
8. Bidens cernua var. integra
9. Bidens cernua var. minima
10. Bidens cernua var. oligodenta
11. Bidens connata var. pinnata
12. Bidens connata var. fallax
13. Bidens foliosus ??
14. Centaurea cyanus
15. Crepis runciniata
16. Crepis tectorum
17. Helianthus spp.
18. Hieracium umbellatum
19. Krigia amplexecaulis
20. Lactuca ludoviciana
21. Lactuca scariola
22. Matricaria chamoilla
23. Matricaria suavolens
24. Senecio aureus
25. Senecio palustris ??
26. Senecio plattensis
27. Solidago bicolor. Is there a good species in the Park?
28. Solidago humilis
29. Solidago uliginosa
30. Sonchus asper, confused with S. arvense; may be more abundant than suspected.
31. Tragopogon pratensis

Statistics on the Compositae of Itasca Park

There are eight tribes represented; 31 genera, 95 species and varieties, or a total of 104 species and varieties, of Compositae recorded for Itasca Park. Of the 104, 31 are rare or of doubtful occurrence, leaving 73 species and varieties that are common, or nearly so.

There are 39 species and varieties that are not represented in the herbarium at the Biological Station. Of these 39 species and varieties, I have collected 22 species, leaving 17 unaccounted for.

Compositae of Itasca Park
(From Grant's Check List)

1. Achillea lanulosa
2. Ambrosia artemisiifolia
3. A. psilostachya
4. A. trifida
5. Anaphalis margaritaceae
6. Antennaria canadensis
7. A. fallax
8. A. neodioica
9. A. plantaginifolia
10. Artemisia absinthium
11. A. camporum
12. A. caudata
13. A. ludoviciana
14. Aster azureus
15. A. ericoides (multiflorus)
16. A. junceus
17. A. laevis
18. A. lateriflorus
19. A. Lindleyanus
    var. comatus
20. A. lucidulus
21. A. macrophyllus var. velutinus
22. A. paniculatus
23. A. ptarmicoides
24. A. puniceus
25. A. umbellatus
26. Bidens cernua
    var. integra
    var. minimia
    var. oligodonta
27. B. comosa
28. B. connata
    var. fallax
29. B. foliosus
30. Centaurea cyanus
31. Cirsium arvense
32. C. lanceolatum
33. C. muticum
34. Crepis runcinata
35. Erigeron canadensis
36. E. philadelphicus
37. E. ramosus
38. Eupatorium Bruneri
39. E. perfoliatum
40. Gnaphalum uliginosum
41. Helianthus borealis
42. H. maximiliani
43. H. subrhomboideus
44. H. decapetalus
45. Heliopsis scabra
46. Hieracium canadense
47. H. scabrum
48. H. umbellatum
49. Iva xanthifolia
50. Krigia amplexicaulis
51. Lactuca canadensis
52. L. ludoviciana
53. L. pulchella
54. L. scariola
55. L. spicata
56. Liatris pycnostachya
57. L. Rosendahlii
58. L. scariosa
59. Matricaria chamomilla
60. M. suaveolens
61. Megalodonta Beckii
62. Petasites palmatus
63. P. sagittatus
64. P. trigonophyllus
65. P. vitifolius
66. Prenanthes alba
67. Rudbeckia hirta
68. R. laciniata
69. Senecio aureus
70. Senecio pauperculus var. balsamitae
71. S. palustris
72. S. plattensis
73. Solidago canadensis
    var. gilvocanescens
74. S. bicolor
75. S. flexicaulis
76. S. graminifolia
77. S. hispida
78. S. humilis
79. S. juncea
80. S. nemoralis
81. S. rigida
82. S. serotina
83. Sonchus arvense
84. Tanacetum vulgare
85. Taraxacum laevegatum
86. T. officinale
87. Tragopogon pratensis

Compositae of Itasca Park
B. R. L. - 1938

I. EUPATORIEAE
  A. Eupatorium
    1. E. Bruneri Gray (E. purpureum L.)
    2. E. perfoliatum L.
  B. Liatris
    3. L. pycnostachya (Michx.) Kuntze
    4. L. scariosa Willd.
    5. L. Rosendahlii Rydb.
II. ASTEREAE
  C. Aster
    6. A. azureus Lindl.
    7. A. ericoides L. (A. multiflorus Ait.)
    8. A. junceus Ait.
    9. A. laevis L.
    10. A. lateriflorus (L.)Britton
    11. A. Lindleyanus T.&G.
    12. A. " var. comatus Fernald
    13. A. macrophyllus L. var. velutimus Burgess
    14. A. paniculatus Lam.
    15. A. puniceus L.
    16. A. " var. lucidulus A. Gray
    17. A. ptarmicoides T.& G.
    18. A. umbellatus Mill.
    19. A. " var. pubens A. Gray
  D. Erigeron
    20. E. canadensis L.
    21. E. philadelphicus L.
    22. E. ramosus (Walt.) BSP
  E. Solidago
    23. S. canadensis L.
    24. S. " var. gilvocanescens Rydb.
    25. S. bicolor L.
    26. S. flexicaulis L. (S. latifolia L.)
    27. S. graminifolia (L.) Salisb.
    28. S. hispida Muhl.
    29. S. humilus Pursh. (S. Purshii Porter, S. racemosa Greene)
    30. S. juncea Ait.
    31. S. nemoralis Ait.
    32. S. rigida L.
    33. S. serotina Ait.
    34. S. uliginosa Nutt.
III. INULEAE
  F. Antennaria
    35. A. canadensis Greene
    36. A. neodioica Greene
    37. A. fallax Greene
    38. A. plantaginifolia (L.) Richards
  G. Anaphalis
    39. A. margaritacea (L.) B&H
  H. Gnaphalum
    40. G. uliginosum L.

IV. HELIANTHEAE

I. Ambrosia

41. A. artemisiifolia L.
42. A. psilostachya DC
43. A. trifida L.

J. Bidens

44. B. Beckii Torr. (Megalodonta Beckii (Torr.) Greene)
45. B. cernua L.
46. " " var. integra Wiegand
47. " " var. minima (Huds.) DC
48. " " var. oligodenta Fern. & St. John
49. B. comosa (Gray) Wiegand
50. B. connata Muhl.
51. " " var. pinnata Watson
52. " " var. fallax (Warmst.) Sherff
53. B. foliosus ????

K. Helianthus

54. H. borealis Watson
55. H. decapetalus L.
56. H. grosse-serratus Marten
57. H. giganteus L.
58. H. membranaceus Watson
59. H. Maximiliani Schrad.
60. H. scabarrimus Ell. (H. rigidus Desf., H. subrhomboideus Rydb.)
61. H. tuberosus L.

L. Heliopsis

62. H. scabra Duval

M. Iva

63. I. xanthifolia Nutt.

N. Rudbeckia

64. R. hirta L.
65. R. laciniata L.

V. ANTHEMIDEAE

O. Achillea

66. A. lanulosa Nutt.

P. Artemisia

67. A. absinthium L.
68. A. biennis Willd.
69. A. camporum Rydb.
70. A. caudata Michx.
71. A. ludoviciana Nutt.

Q. Matricaria

72. M. chamomilla L.
73. M. suaveolens (Pursh) Buckenan.

R. Tanacetum

74. T. vulgare L.

VI. SENECIONEAE

S. Petasites

75. P. palmatus (Ait.) Gray
76. P. sagittatus (Pursh) Gray
77. P. trigonophyllus Greene
78. P. vitifolius Greene

T. Senecio

79. S. aureus L.
80. S. Balsamitae Muhl. (S. pauperculus Michx. var. balsamitae (Muhl.) Fern.)
81. S. palustris (L.) Hook.
82. S. plattensis Nutt.

VII. CYNAREAE
- U. Arctium
  - 83. A. minus Bernh.
- V. Centaurea
  - 84. C. cyanus L.
- W. Cirsium
  - 85. C. arvense (L.) Scop.
  - 86. C. lanceolatus L.
  - 87. C. muticum Michx.

VIII. CHICHORIEAE
- X. Crepis
  - 88. C. runciniata (James) T&G
  - 89. C. tectorum L.
- Y. Krigia
  - 90. K. amplexecaulis Nutt. (Adopogon virginicum Ktze.)
- Z. Hieracium
  - 91. H. canadense Michx.
  - 92. H. scabrum Michx.
  - 93. H. umbellatum L.
- AA. Lactuca
  - 94. L. canadensis L.
  - 95. L. ludoviciana (Nutt.) Ridell
  - 96. L. pulchella (Pursh) DC
  - 97. L. scariola L.
  - 98. L. spicata (Lam.) Hitchc.
- BB. Prenanthes
  - 99. P. alba L.
- CC. Sonchus
  - 100. S. arvense L.
  - 101. S. asper
- DD. Taraxacum
  - 102. T. erythrospermum Andrz.
  - 103. T. officinale Weber
- EE. Tragopogon
  - 104. T. pratensis L.

Conclusion

This problem is far from completion. The original intention was to determine the favorite soil, pH, etc., of each species of the composites of Itasca Park. Such a problem proved too difficult to complete in five weeks.

If I have cleared up any problems at all I will be well repaid for my work. I would like to suggest that the Helianthus group be studied by one who is at least on speaking terms with them.

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